difficulty. Sodium vapour attacks all silicates. Sodium distils near the temperature of fused salt. If not volatilised, it forms a conducting bridge from the kathode. It attacks iron, though slowly. Hot porcelain and earthenware conduct electrolytically—as, by the way, the maker of electric frying-pans knows—hot chlorine attacks metals, even when dry, and hot carbon cannot be exposed to the air. In addition, sodium and perhaps chlorine are soluble in hot salt, and traces of sulphate in the salt act as carriers. I could a tale unfold if I read out laboratory notes of sodium experiments on a fairly large scale. The difficulties are all incidental, though, and I have little doubt electrolytic sodium at a few pounds per ton will be in the market soon, and will affect profoundly many chemical and metallurgical industries.

In metallurgy, electrolytic solution processes are in use or on trial for the more valuable metals, such as copper and nickel. The reaction between chlorine and metallic sulphides at high temperatures brings the whole domain of sulphide ores under our sway. Thus a sulphide, say galena, is treated with chlorine, which gives off the sulphur as sulphur, which is condensed and sold, making chloride of lead. The silver is extracted by stirring with a little lead, and the fused salt is then electrolysed, yielding pure desilverised lead and chlorine. The process is thus self-contained, yielding sulphur, lead and silver. It is specially applicable to mixed refractory ores which are now nearly valueless and very plentiful, and contain much metal content, such as the mixed lead-zinc sulphides of America or Australia. These reactions have been proved on the large or ton scale, and there is no technical difficulty. Unfortunately, mine people are somewhat ignorant of electrical matters, and it is exceedingly difficult to get them to understand or appreciate a process like this, capable though it may be of paying good dividends on very large capitals indeed.

Our limit in electrolysis in this country is almost entirely human inertia. Commercial and financial people do not understand it, and fight shy of it. But our technical people are nearly as bad. The pure physicist, as a rule, takes no interest in electrolysis or physical chemistry, and thinks it belongs to the chemical classroom on the other side of the passage. The chemist thinks it is higher mathematics and will have none of it, the mathematician thinks it may be an exercise in differential equations; but they are all agreed that it is a sort of continental fungus which flourishes with no roots, and that it is beneath the attention of a scientific man to know enough about it to give a reason for the broad statement that it is all nonsense.

DUTY-FREE ALCOHOL FOR SCIENTIFIC PURPOSES.

TEACHERS of organic chemistry have often expressed the opinion that alcohol used for purposes of education and research should be relieved of the heavy duty levied upon it. Two years ago, attention was directed to the need for action in the matter, and at the Glasgow meeting of the British Association in 1901, a committee was appointed, with instructions to approach the Board of Inland Revenue, with the object of endeavouring to secure the removal of this tax upon scientific work. As the result, the following regulations have been issued by the Board and published in the daily Press:—

Regulations for the Use of Duty-free Spirit at Universities, Colleges, &c.

(1) An application must be made by the governing body or their representatives, stating the situation of the particular university, college, or public institution for research or teaching, the number of the laboratories therein, the purpose or purposes to which the spirits are to be applied, the bulk qnantity likely to be required in the course of a year, and, if it amounts to fifty gallons or upwards, the name or names of one or more sureties, or a guarantee society to join in a bond that the spirits will be used solely for the purpose requested and at the place specified.

(2) The spirits received at any one institution must only be used in the laboratories of that institution, and must not be distributed for use in the laboratories of any other institution, or used for any other purpose than those authorised.

(3) Only plain British spirits or unsweetened foreign spirits of not less strength than 50 degrees over proof (*i.e.* containing not less than 80 per cent. by weight of absolute alcohol) may be received duty free, and the differential duty must be paid on the foreign spirits.

(4) The spirits must be received under bond either from a distillery or from an Excise or Customs general warehouse and (except with special permission) in quantities of not less than nine bulk gallons at a time. They will be obtainable only on presentation of a requisition signed by the proper supervisor.

(5) On the arrival of the spirits at the institution, the proper Revenue officer should be informed, and the vessels, casks or packages containing them are not to be opened until he has taken an account of the spirits.

(6) The stock of spirits in each institution must be kept under lock in a special compartment under the control of a professor or some responsible officer of the university, college or institution.

(7) The spirits received by the responsible officer of the institution may be distributed by him undiluted to any of the laboratories on the same premises.

(8) No distribution of spirits may be made from the receiving laboratory to other laboratories which are not within the same premises.

(9) A stock book must be provided and kept at the receiving laboratory in which is to be entered on the debit side an account of the bulk and proof gallons of spirits received with the date of receipt, and on the credit side an account of the bulk and proof gallons distributed to other laboratories. A stock book must also be kept at each other laboratory, in which must be entered on the day of receipt an account of the bulk and proof gallons of spirits received from the receiving laboratory.

These books must be open at all times to the inspection of the Revenue officer, and he will be at liberty to make any extract from them which he may consider necessary.

(10) The quantity of spirits in stock at any one time must not exceed half the estimated quantity required in a year where that quantity amounts to twenty gallons or upwards.

(11) Any contravention of the regulations may involve the withdrawal of the Board's authority to use duty-free spirits.

(12) It must be understood that the Board of Inland Revenue reserve to themselves full discretion to withhold permission for the use of duty-free spirit in any case in which the circumstances may not seem to them to be such as to warrant the grant of it.

J. B. MEERS,
Secretary.

Inland Revenue, Somerset House, W.C., November 17.

NOTE.—"Proof Spirit" is defined by law to be such spirit as at the temperature of 51° Fahrenheit shall weigh $\frac{12}{13}$ths of an equal measure of distilled water.

Taking water at 51° Fahrenheit as unity, the specific gravity of "proof spirit" at 51° Fahrenheit is 0·92308. When such spirit is raised to the more usual temperature of 60° Fahrenheit, the specific gravity is 0·91984.

To calculate the quantity of spirits at proof in a given quantity of spirit over or under proof strength:—Multiply the quantity of spirit by the number of degrees of strength of the spirit, and divide the product by 100. The number of degrees of strength of any spirit is 100 *plus* the number of degrees overproof, or *minus* the number of degrees underproof.

EXAMPLE:—19·8 gallons of spirits at 64·5 overproof
100 + 64·5 = 164·5 proof strength.
164·5 × 19·8 ÷ 100 = 32·571
taken as 32·5 gallons at proof.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—In connection with the School of Geography, Mr. Mackinder will lecture weekly during Hilary term on the historical geography of Europe, Mr. Dickson will lecture on surveying and mapping and on the climatic regions of the globe; he will also give, in conjunction with Mr. Darbishire, practical instruction in military topography; Mr. Herbertson will lecture on the British Isles, the regional geography of continental Europe, and on types of land forms, mountains and coasts; Dr. Grundy will lecture on the historical topography of Greece, and Mr. Beazley on the period of the great discoveries, 1480–1650.

SIR WILLIAM COLLINS has accepted the invitation to stand as the Liberal candidate for London University at the ensuing Parliamentary by-election.

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WE learn from *Science* that at a recent meeting of the National Academy of Sciences, a grant of eight hundred dollars was made from the income of the J. Lawrence Smith bequest to Dr. O. C. Farrington, of the Field Columbian Museum, Chicago, to enable him to conduct certain investigations upon American meteorites.

JUST as in this country there are gratifying signs that teachers in secondary schools are making earnest efforts to acquaint themselves with scientific methods of teaching the subjects of the school curriculum, so in France there is a movement in the same direction. We learn from the *Révue générale des Sciences* that M. Liard, vice-rector of the Académie de Paris, is organising conferences of teachers in secondary schools at which the chief inspectors will explain to French schoolmasters the objects it is desired they shall have in view in their teaching. The first conference was confined to teachers of modern languages and the second was devoted to a consideration of the teaching of physical and natural science.

ANOTHER instance of the large scale on which provision is made for every grade of education in America is afforded by the post-graduate medical school that has recently been incorporated in the city of Washington. There are to be, we learn from the *Lancet*, 104 professorships established, as follows:—Six of preventive medicine, two of medical zoology, one of protective inoculation, serum-therapy and biochemistry, two of sanitary chemistry, eight of bacteriology, seven of pathology, fourteen of internal medicine and therapeutics, one of surgical anatomy, fourteen of surgery, six of military medicine and surgery, two of orthopædic surgery, nine of gynæcology, six of obstetrics, three of tropical diseases, four of diseases of children, two of mental and nervous diseases and electrotherapeutics, two of diseases of the stomach, eight of diseases of the eye, eight of diseases of the nose, throat and ear, four of special diseases and four of diseases of the skin.

THE examination of the calendars of different University Colleges soon convinces the student of education that every class of society in the city where the college is located must come under its influence. In the case of the University College of Nottingham, for example, we find from the new calendar that for the twenty-second session of the college there are, in addition to lectures for preparing to graduate in the various university faculties, classes for artisans engaged in the engineering, building, and lace and hosiery trades. Students of the same college may be studying subjects so far removed as Greek and plumbing, Anglo-Saxon and pattern-making. While one student is training to become a schoolmaster and is attending lectures on psychology and pedagogics, another hopes to develop into an electrical engineer, and spends his time at electrical measurements in the physical laboratory. In such an institution, it should be impossible for a student to obtain other than a broad, catholic way of regarding the various branches of human knowledge.

IT is a pertinent question whether we as a nation are incapable of looking ahead or whether we are too apathetic to provide for future contingencies. On all sides, warning voices proclaim the deficiencies in our educational system, lack of enterprise and antiquated methods. Prof. Bower availed himself of the opportunity afforded when he was delivering his inaugural address before the North British branch of the Pharmaceutical Society to point out how one practical side of botany, the study of vegetable economics, is ignored in this country at the present time. What is required is a well-equipped staff, including specialists in botany, physics, chemistry and physiology, to provide training for students, to institute research and furnish expert advice. Neither at Kew, which, as Prof. Bayley Balfour later expressed it, acts as the clearing-house for the Empire, nor elsewhere is such a staff to be found. The study of vegetable economics might, in Prof. Bower's opinion, be advantageously pursued in commercial centres such as Glasgow, Liverpool and Belfast, and he has laid before the authorities of his University the desirability of appointing a special lecturer in this subject.

ON December 3, a conference on "Nature-study" was held with special reference to the development of the work of Stepney Borough Museum with the schools. Mr. J. H. Wylie presided over the meeting, which was held in the Art Gallery, and Canon Barnett, in welcoming the audience, brought forward a suggestion that the winter garden of the People's Palace should be made into a Nature-study centre. Mr. A. D. Hall gave a general address and offered no explanation of the meaning of Nature-study, saying that as most of his audience were teachers that difficulty was removed. He urged that living things should be studied, not collections of dead things in boxes, and suggested the growing of food plants in East-end schools. Bean seedlings, he said, could be measured by the children, who could then make curves illustrating the growth on squared paper. His only allusion to the Museum was in connection with a supposed annual outing of the children, and he suggested that the journey then undertaken might be illustrated in the institution. Prof. Farmer alluded to the help as regards material to be obtained from the Chelsea Physic Garden. The Rev. Claude Hinscliff stated that the object of the conference had been lost sight of, and showed the necessity of opening the eyes of the East-ender by means of the Museum to what he might see when he did go into the country. Mr. F. C. Mills, the chairman of the Museum committee, expressed his pleasure as regards the interest taken in the conference, in spite of the fact that its purpose had been unfulfilled. The School Board inspector for the district alluded to work such as that suggested by Mr. Hall and of an elementary biological nature having been carried on for years at the schools in which he was interested. Mr. Wilfred Mark Webb urged the teachers not to introduce formal and systematic lessons, and Miss Kate Hall, the curator of the Museum, who had organised the conference, spoke of her intentions and requirements.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 27.—"Descending Intrinsic Spinal Tracts in the Mammalian Cord." By C. S. Sherrington, M.A., M.D., F.R.S., and E. E. Laslett, M.D. Vict.

Experiments inquiring into the existence of spinal paths connecting the activity of segments situate nearer the head with segments lying further from the head.

The method adopted may be termed the method of "*successive degeneration.*" It consists in producing two or more successive degenerations with allowance of a considerable interval of time between them. In the piece of cord to be examined, a first degeneration is allowed time enough to remove all the tracts descending from sources other than those the immediate object of inquiry. When the time is complete, the cord is left, as it were, like a cleaned slate, on which once more a new degeneration can be written without fear of confusion with a previous one. The cord is then ready for receiving the lesion which shall cause degeneration of the particular tracts the existence of which is suspected. After a period suitable for the full development of the new degeneration, the cord is treated histologically by the Marchi method, and the microscopical examination proceeded to.

Results.

The spinal segments examined as sources of aborally-running fibre-systems have been posterior cervical, anterior thoracic, mid thoracic, posterior thoracic and anterior lumbar. From all these regions, the experiments demonstrate that copious aborally-running fibre-systems spring.

Speaking generally, of the fibres composing the aborally-running systems springing from the grey matter of the spinal segments examined, there may be distinguished two sets. For physiological description, it is in some ways convenient to regard the length of the spinal cord as divisible into regions; thus, a brachial for the fore limb, a thoracic for the trunk, a crural for the hind limb, a pelvic for pelvic organs, a caudal for the tail, and so on. A reflex initiated *viâ* an afferent path of one such spinal region may evoke its peripheral effect by efferent paths of a spinal region other than that to which the original entrant path belongs. Such a reflex has in a former paper by one of us [1] been termed a "long" spinal reflex, in contradistinction to reflexes the centripetal and centrifugal paths of which both belong to one and the same spinal region. The latter reflex it was proposed to term "short." [2] Analogously, in the aborally-running fibre-systems of the spinal segments examined, by our experiments fibres of two categories are found, one a set passing beyond the limits of the spinal region in which they arise, the other not passing beyond those

[1] C. S. Sherrington, "Croonian Lecture," *Phil. Trans.*, 1897.
[2] *Ibid.*

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